Cisco Enterprise Perspective on Indoor Location

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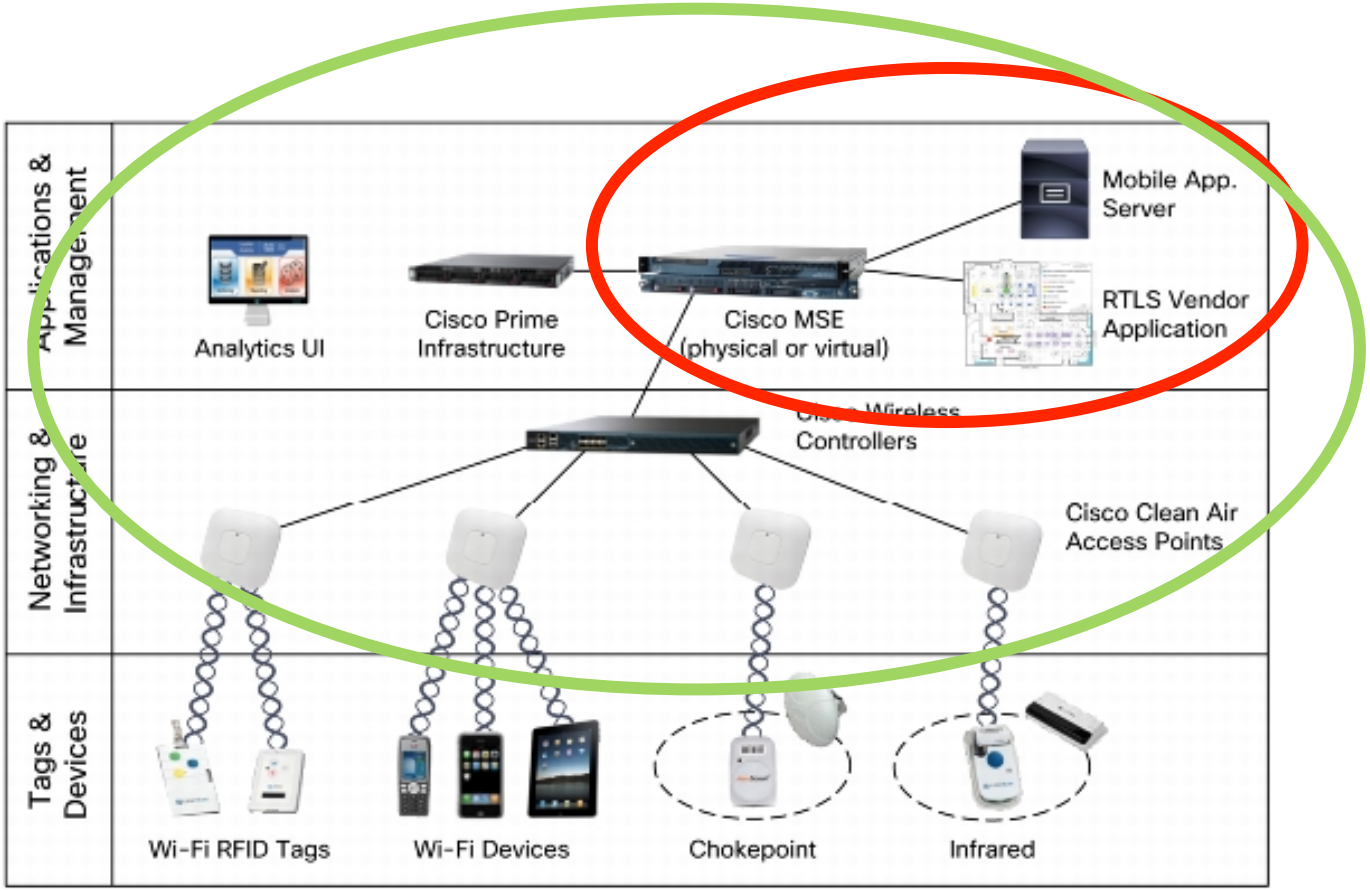
Agenda

- Cisco Unified Wireless Network Architecture
- Market Segments and Existing Use Cases
- Evolving Use Cases
- Industry Activities

Cisco Unified Wireless Network Architecture



MSE is used for

- Client location
- Rogue AP/client location
- Asset tracking
- Non-Wi-Fi interferer location
- Connected Mobile Experience
- Wireless Intrusion Protection system

MSE is a relatively small incremental addition to an existing Wi-Fi network *not* a new overlay network

Typically venues also install extra APs for extra accuracy & throughput

Market Segments and Existing Use Cases

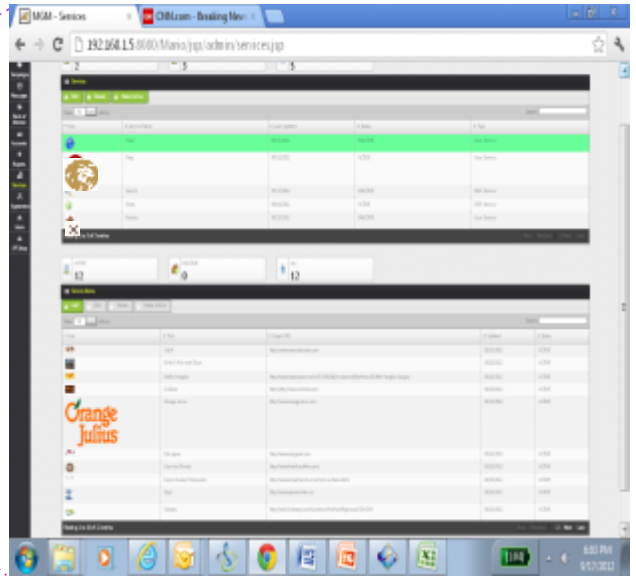
Market Segment	Market Share	Existing Use Cases
Healthcare	30%	Asset tracking, indoor navigation
Education	25%	Network management/ troubleshooting, rogue & interferer location, analytics on people flows
Retail	20%	Find the expert, valuing floorspace (analytics), optimizing staffing levels
Hospitality	10%	VIP meet and greet; virtual walls for gambling
Enterprise	10%	Network management/ troubleshooting, rogue & interferer location, space utilization
Transportation hubs	5%	Congestion detection and remediation (dwell times and locations)

Evolving Use Cases

- Hospitality
- Retail
- Financial
- Higher Education
- Healthcare

Hospitality & Retail: Guest Engagement

WLAN



Value-added services first then hyperlocal ads

Real-time, Web-based Relevant Content

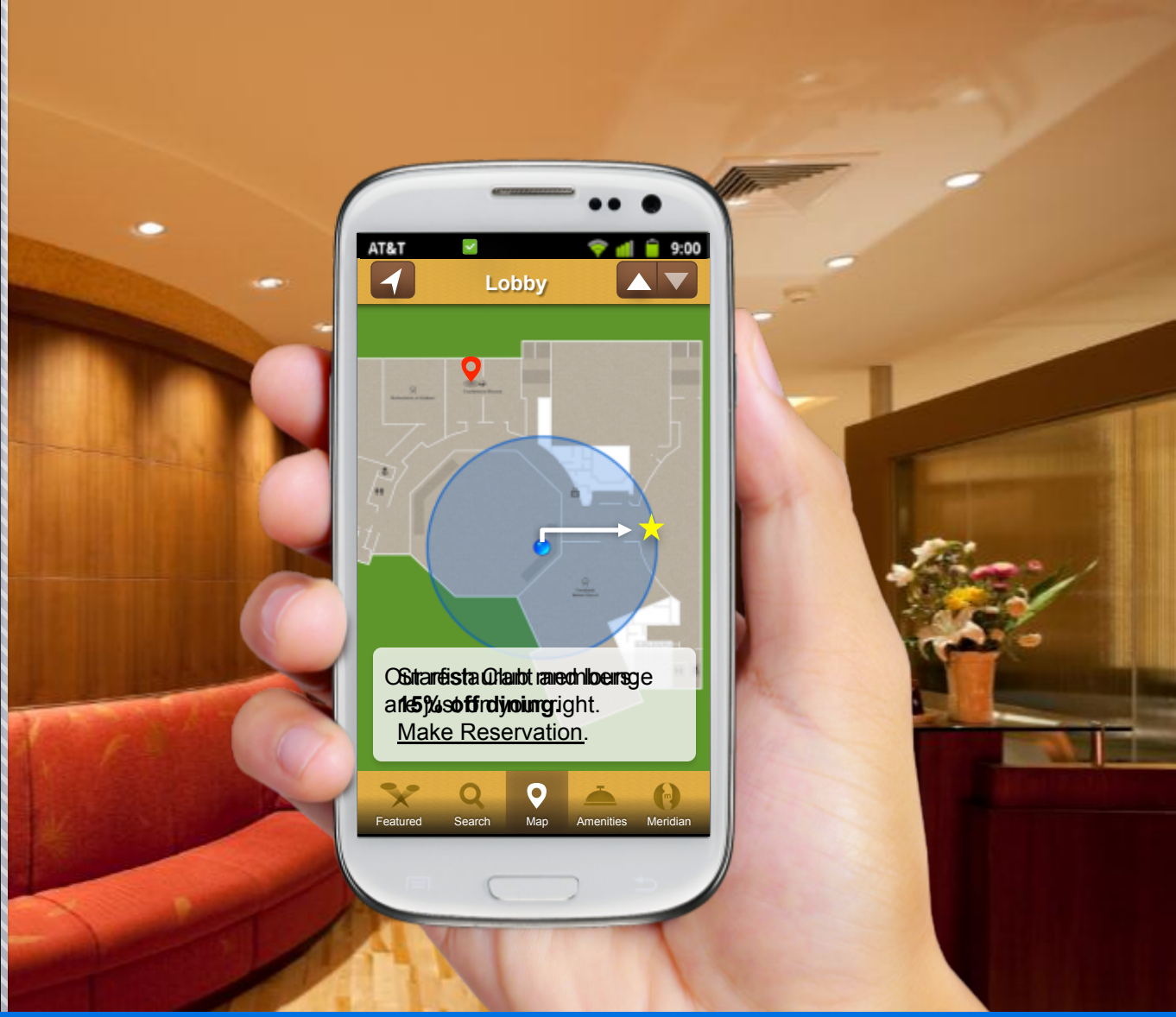
Hotel Experience

- Context-Based Information based on Visitor Location

Hotel Experience

Transforming Guest Experience with Personalized Wi-Fi Services

- Indoor Route Search Tool



Hotel Experience

Transforming Guest Experience with Personalized Wi-Fi Services

- Indoor Maps: As Quick As Search Tool

Hotel Experience

Transforming Guest Experience with Personalized Wi-Fi Services

Retail Use Case

Requirement Area Description

Technically this use case requires indoor location, graphing technology, location policy

High-Level Motivation

Retailers want to optimize store operation around having sales association in the appropriate part of store based on customer crowding. If customers in the front of the store and they need help at the cash registers. The ultimate goal is to optimize cost of cashiers.

Tasks

Store operations configures the policy on ratio of store associates to customers and message to be sent.

Role

The store operation mgr. is the main user of this use case

Triggers

Actions

Retail Use Cases

I. Checkout Optimization

Proactively anticipate checkout traffic and dynamically staff front end resources to reduce customer wait times and increase associate productivity

- Provide front end managers with proactive (immediate) recommendations to support service levels and repurpose excess labor for other store tasks
- Provide front end staffing recommendations to optimize local labor planning

II. On-Shelf Availability

Proactively anticipate potential out of stocks and dynamically adjust labor to restock and increase on-shelf availability

- Provide store associates with real time alerts/ recommendations for re-stocking
- Provide merchandise stocking models for localized inventory and labor planning

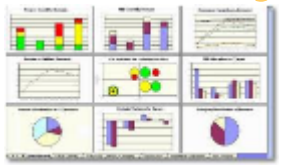
Optimizing the Checkout drives customer sat and associate productivity

- Video Surveillance vehicle counting

- Wi-Fi location - shoppers & associates

- Cart tagging

- Checkout line monitoring



- Assignment notifications, overrides, & feedback

4 **Realtime Dashboard**

1 **Sensor Fusion**

Fusion Engine

Store Systems

3 **Associate Assignment**

2

2 **Context Enrichment**

Fast Data Engine
- Policy Based Rules
- Machine Learning

- Weather, events, other

2

Operational Data Sources:
- POS, Mobile Scan, Others

Value Drivers

Operational Efficiency
- Higher Associate Utilization

Customer Satisfaction
- Shorter/No Lines
- Faster Assistance

Employee Satisfaction
- Better Skill Alignment
- Less Stress
- More Engagement

Financial Use Case

Requirement Area Description

Bank wants to use the network location to notify Branch Manger when a VIP customer enters the bank. They also want to display appropriate message on the digital signage based on who is in the bank – Mortgage loan v/s retirement products.

Tasks

Marketing configures the location zones for the venue
Marketing enters a series of messages and forms campaigns for those messages
Marketing configures the policy on which to trigger a campaign

Role

The marketing dept. is main user in this use case

Triggers

The triggers in this use case are new marketing campaigns, new additions to the venue

Actions

Bank wants to start engaging their customers when they are in the branch thru geo fencing & detecting presence

Higher Ed Use Case

Requirement Area Description

Way finding / Turn by turn directions
Augmented reality with location specific updates
Browser based communication – provide mass notifications
Help desk support to resolve location specific BW issues
Location Analytics – density, dwell times, typical paths
.

High-Level Motivation

College wants to improve on campus student experience using location analytics & app / browser engage

Tasks

IT configures the location zones for the campus
NW Ops enters a series of messages and alerts
NW Ops / IT configures the policy on which to trigger a campaign

Role

The NW ops & IT depts. Are main user in this use case

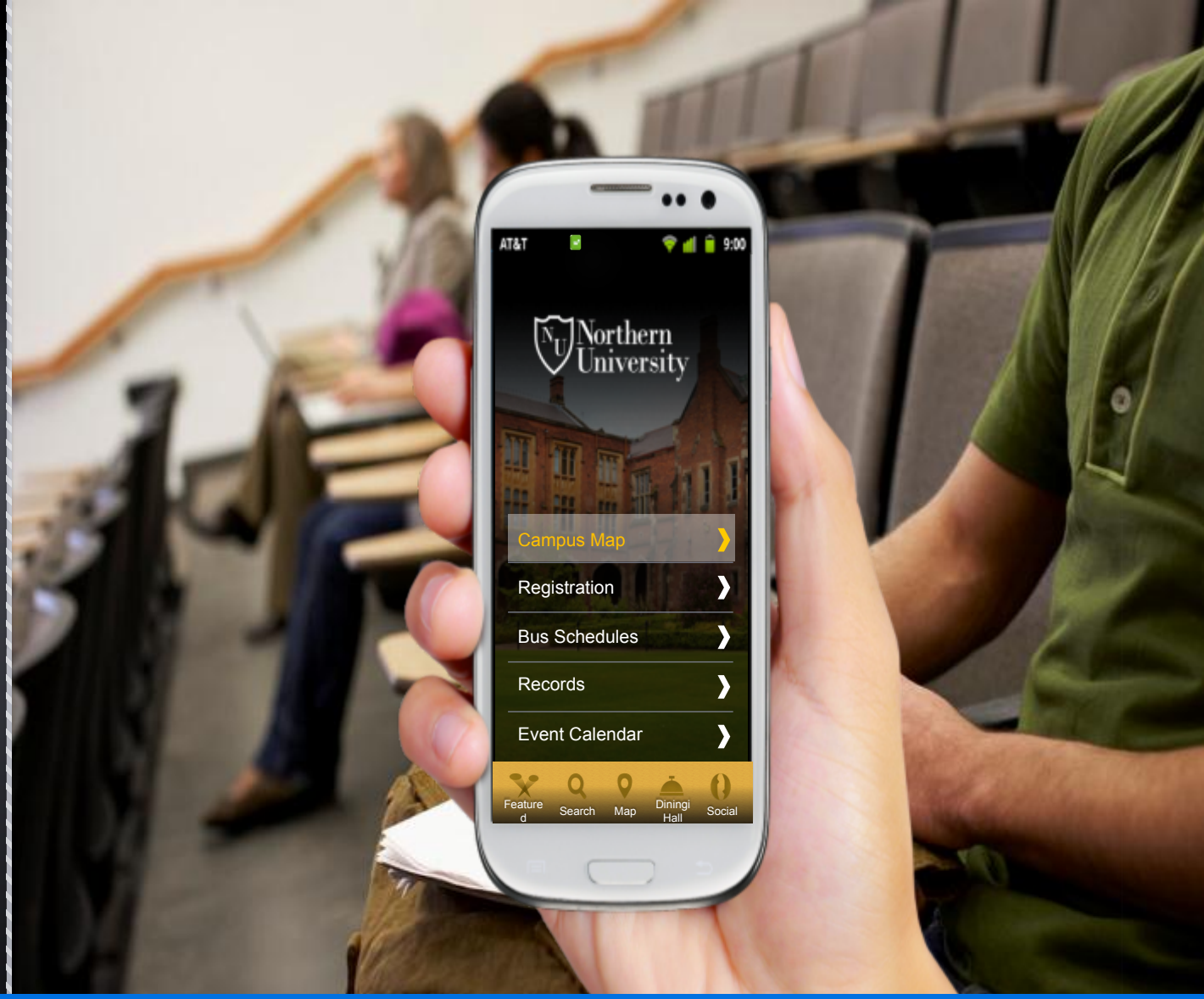
Triggers

There are multiple triggers. Following slides provide details

Actions

Pls see next slides

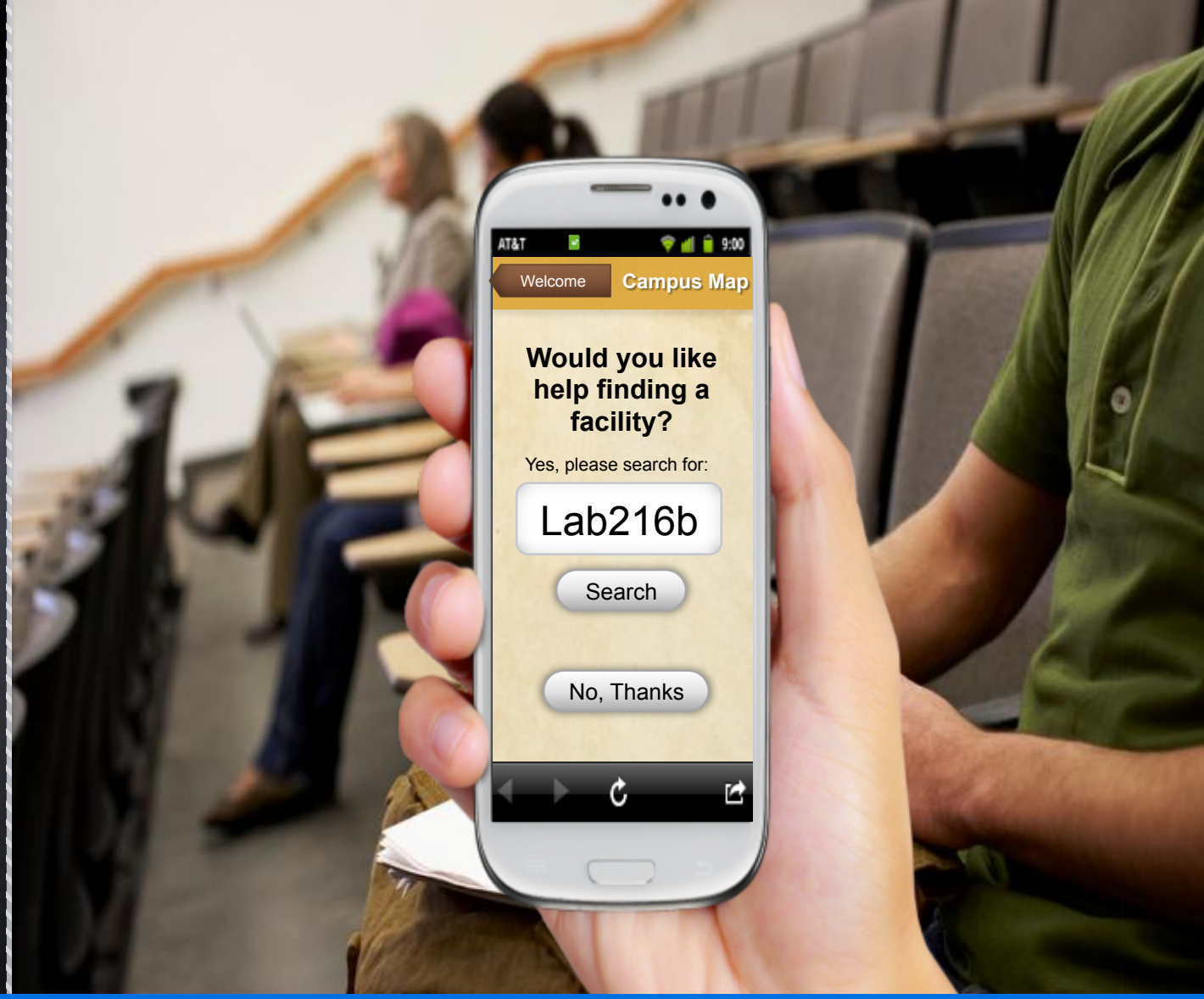
- Navigation Integrated into Student App



Higher Education

Transforming User Experience with Personalized Wi-Fi Services

- Personalized Tour Guide



Higher Education

Transforming User Experience with Personalized Wi-Fi Services

- Turn by Turn navigation based on Location

Higher Education

Transforming User Experience with Personalized Wi-Fi Services

- Augmented Reality with Location-Specific Updates

Higher Education

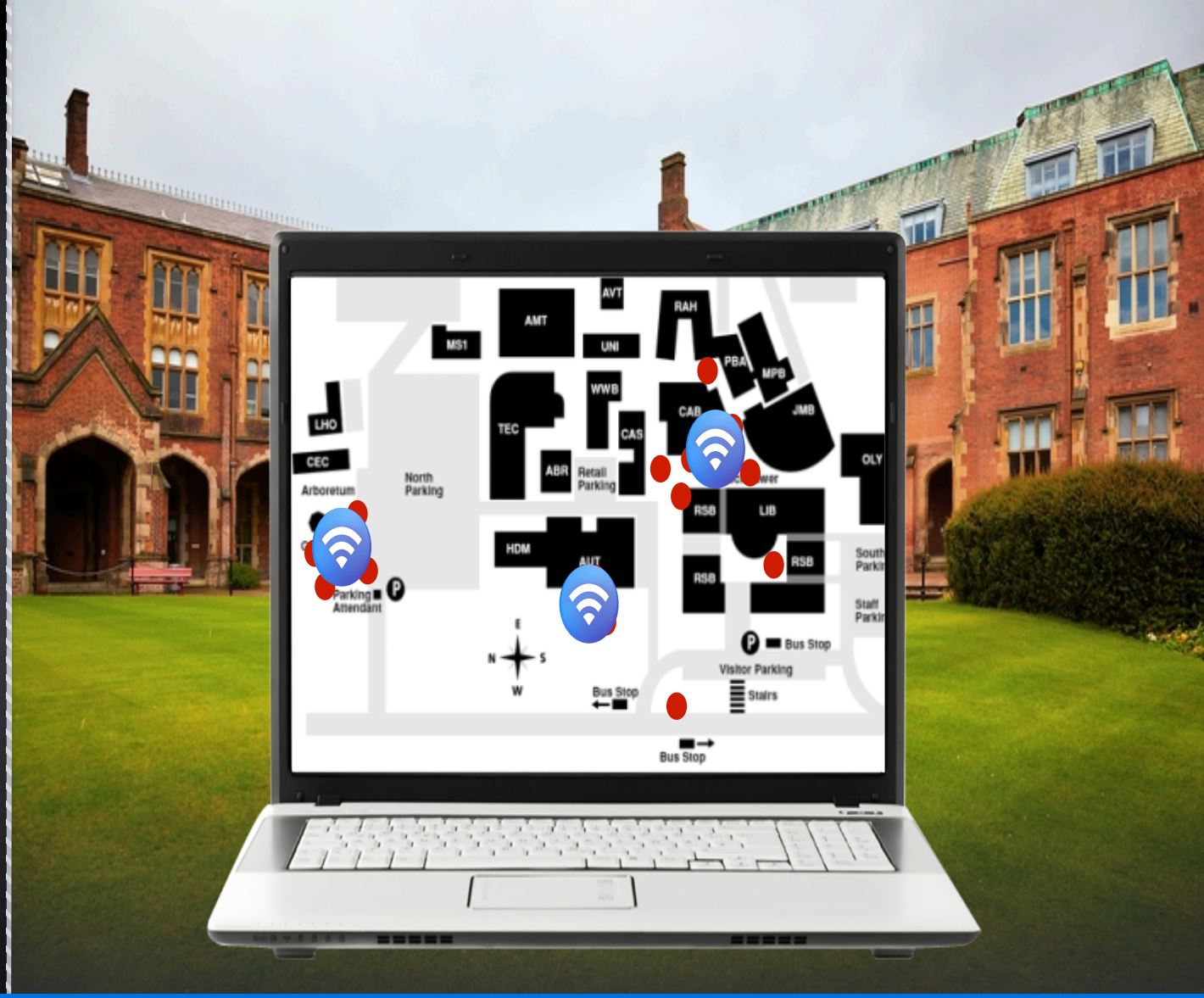
Transforming User Experience with Personalized Wi-Fi Services

- Helpdesk complaints from students over bandwidth

Higher Education

Increasing Efficiencies Through Wi-Fi-based Location Analytics

- Increasing Efficiency with Calculated Bandwidth Planning



Higher Education

Increasing Efficiencies Through Wi-Fi-based Location Analytics

- Location Analytics: Typical Paths

Higher Education

Increasing Efficiencies Through Wi-Fi-based Location Analytics

- Location Analytics: Dwell Time

Higher Education

Increasing Efficiencies Through Wi-Fi-based Location Analytics

- Location Analytics: Density

Higher Education

Increasing Efficiencies Through Wi-Fi-based Location Analytics

- Location Analytics: Density

Higher Education

Increasing Efficiencies Through Wi-Fi-based Location Analytics

Healthcare Use Case

Requirement Area Description

Push notification & automatically launching app
Way finding / Turn by turn directions – this has financial benefits for hospital
Auto check in
Location based policy trigger to allow access to patient records
Notification when prescription is ready
… Leveraging patient/guest smartphones

Tasks

IT configures the location zones
Marketing enters a series of messages and alerts
IT configures the policy on which to trigger a campaign

Role

Marketing & IT depts. Are main user in this use case

Triggers

There are multiple triggers. Following slides provide details

Actions

Pls see next slides


Search
Prescription sent to **Pharmacy West**
Nearby
Browse Locations


AT&T
3G
9:00
Medical West Hospital
Your prescription will be at Pharmacy West in 12 minutes.
OK
Home
Search
Map
Amenities


AT&T
3G
9:00
Medical West Hospital
Sign off
Don't miss today's Farmer's Market in the Atrium!
Home
Search
Map
Amenities

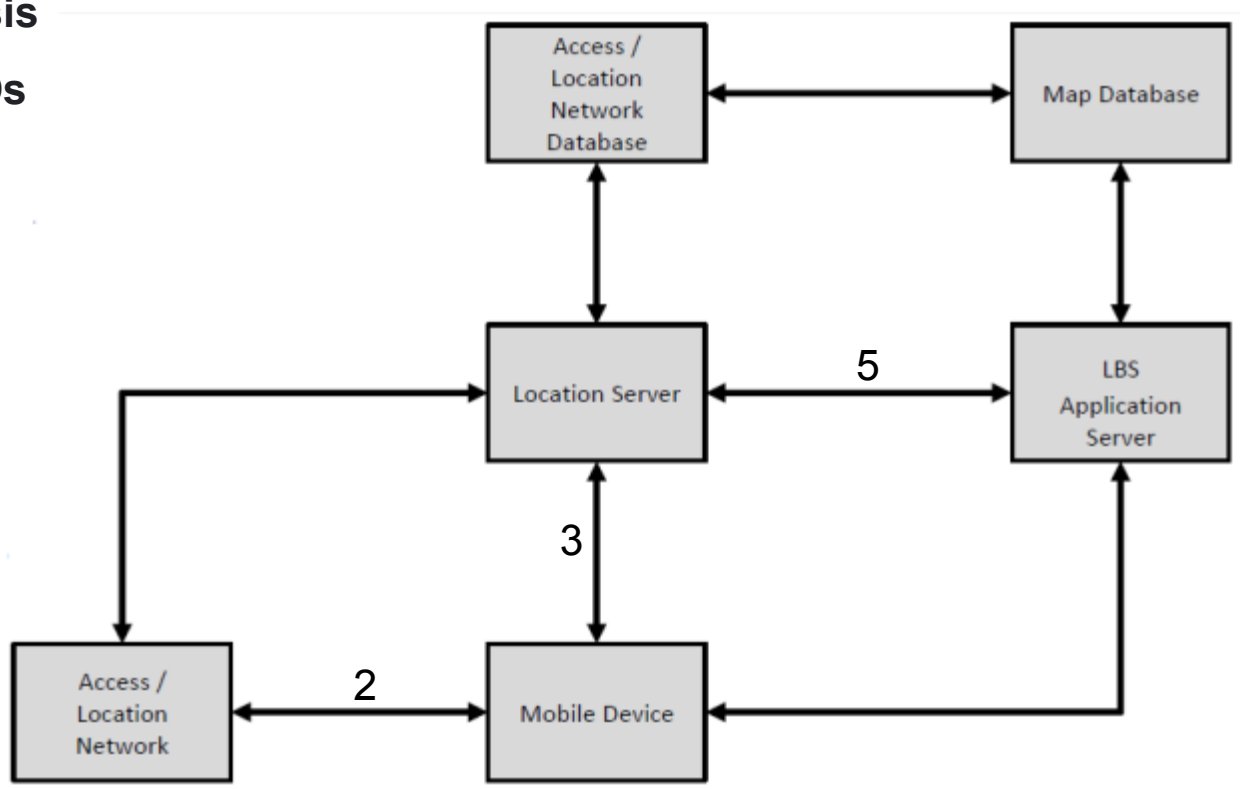
Industry Activities: Indoor Location Alliance

Defining the architecture

Performing a gap analysis

Identifying relevant SDOs

Triggering action

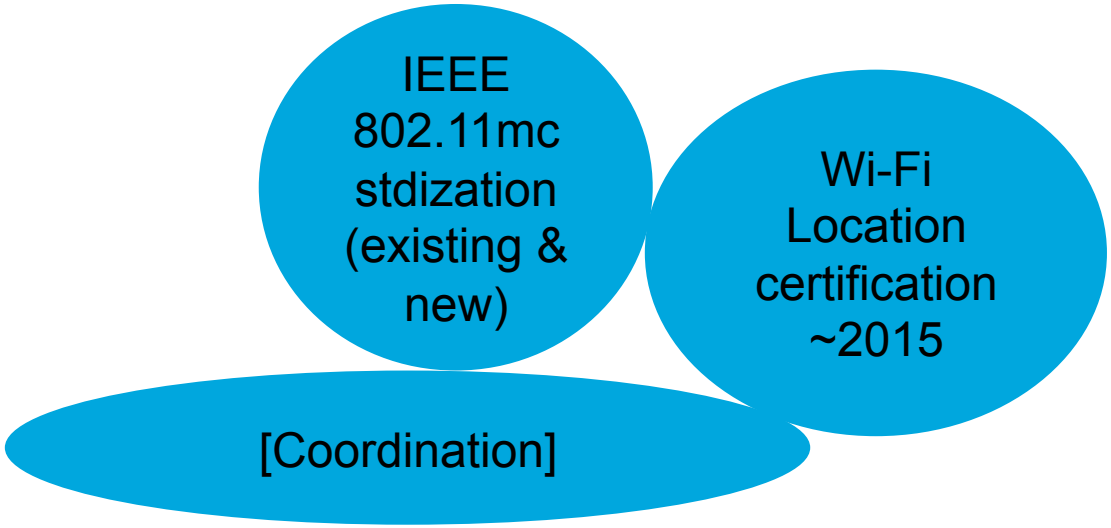


Interface 2: Time of Flight over Wi-Fi : Coordination, Standardization & Certification

Client-AP range available at client

Client-AP range available at AP(s)

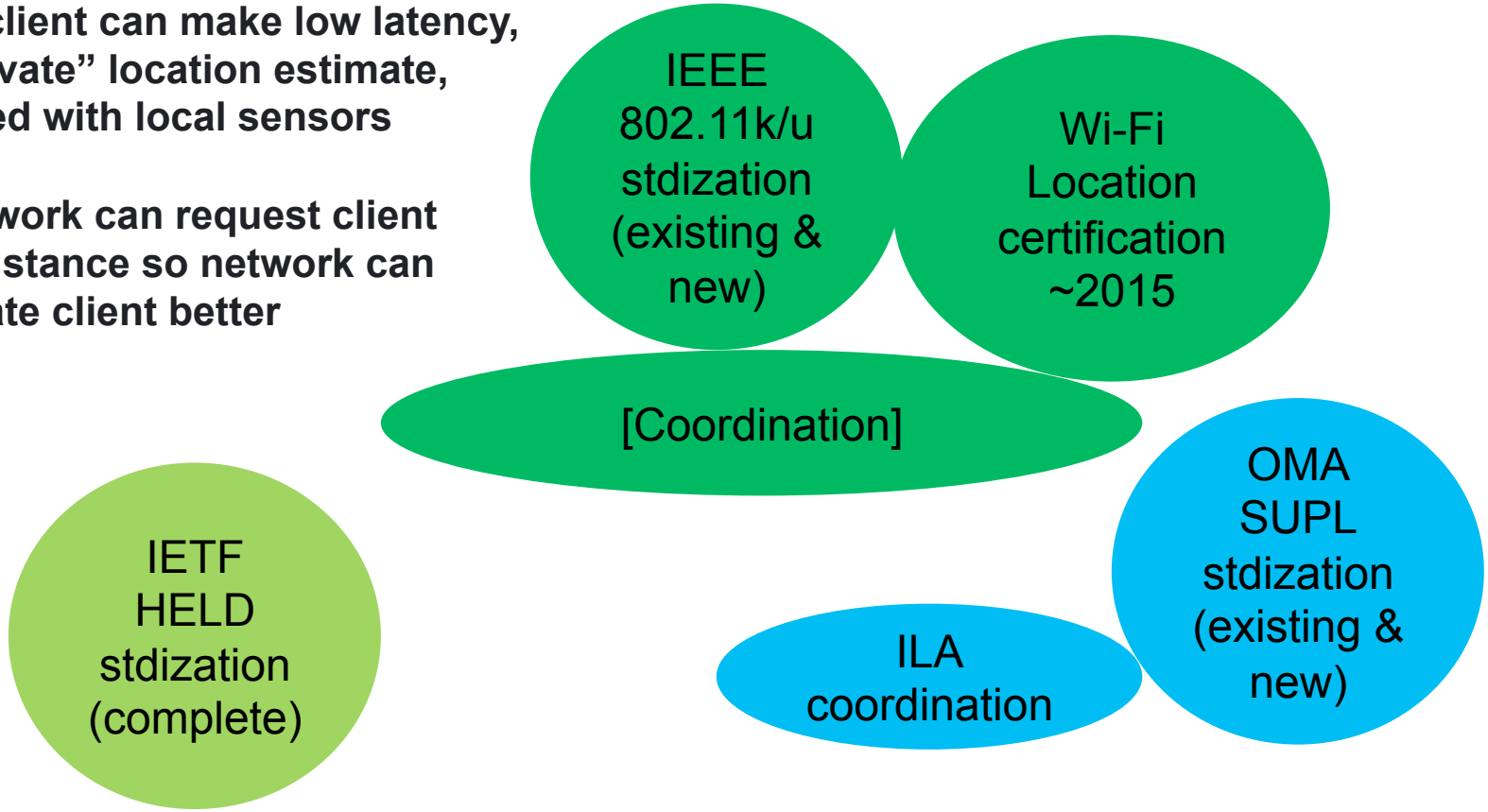
Use Fine Timing Measurement protocol defined in 802.11mc



Interface 3: AP/Client Location between Network & Client: Coordination, Standardization & Certification

Transfer AP locations to client so client can make low latency, "private" location estimate, fused with local sensors

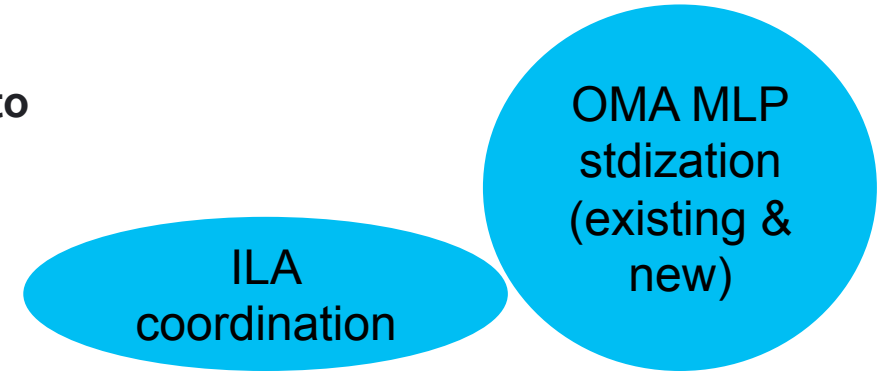
Network can request client assistance so network can locate client better



Interface 5: Location Server Exposes Client Location: Coordination, Standardization & Certification

Network app can poll location server for client location

Certification needs work to meet Wi-Fi expectations



Final thought: we are seeing greater convergence/alignment between cellular and Wi-Fi:

- **Wi-Fi Passpoint leverages cellular credentials & the cellular control plane (for authentication) to help subscribers securely access Wi-Fi networks**
- **OMA SUPL & MLP are cellular protocols that may be adopted for indoor location over Wi-Fi, leading to seamless indoor/outdoor location via the cellular control plane (for venue authorization for providing location services)**